

Applied Physics Important Questions (R20)

Long Answer question (10 marks)

UNIT-I

1. What is Interference? Explain interference in **uniform thin film** (parallel glass plate)?
2. Explain of interference in non-uniform thin films (Newton's ring experiment)?
3. What is diffraction? Explain diffraction due to **single slit**** and **double slit**?
4. What is polarization of light? Discuss how **Nicols Prism** works as polarizer and analyser.
5. Explain Polarisation by reflection, refraction and double refraction?

UNIT-II

6. With the help of neat diagram, explain the construction and working principle of **He-Ne laser**?
7. With the help of neat diagram, explain the construction and working principle of **Nd:YAG laser**?
8. Derive the relation between Einstein co-efficient for 2 level systems?
9. What are the '**acceptance angle**' and '**numerical aperture**' of an optical fiber? Derive the expression for numerical aperture and acceptance angle of optical fiber
10. Types of Optical fibers based on **refractive Index profile** and **mode of propagation**?

UNIT-III

11. Types of dielectric polarization i.e. Electronic, Ionic, and Orientation.
12. Derive the expression for **Claussius - Mosotti equation** with the help of internal field (**Lorentz field**).
13. What is hysteresis? Explain soft and hard magnetic material?
14. Distinguish between **Dia, Para, Ferro, Ferri** and **Anti-Ferro** magnetic materials with examples?
15. Discuss the origin of magnetic moment?

UNIT-IV

16. Derive an expression for energy level, probability to find a particle in 1-D (dimensional box) potential well?****
17. Derive the time independent and dependent Schrödinger wave equations?
18. Explain Fermi-Dirac distribution function? How does it vary with temperature?
19. Explain the Kroning -Penny Model?
20. Explain quantum free electron theory?

UNIT-V

21. What are drift and diffusion currents? Derive the expression for **drift, diffusion** and **Einstein equations**?

22. What is **Hall Effect**? Obtain an expression for Hall co-efficient? *****
23. Derive the expression for **charge concentration** and **Fermi-energy** in **intrinsic** semiconductor.
24. Derive the expression for Fermi-energy level in N-and P-type semiconductors.
25. What is Meissener effect? Prove that superconductor is a very good diamagnetic material?
26. How are cooper pairs formed? Explain **BCS theory** of super conductor?
27. Distinguish between **Type-I** and **Type-II** superconductors? Applications of superconductors?

Short Answer (2 marks)

UNIT-1

- 1) Explain the principle of superposition of waves?
- 2) Distinguish between interference and diffraction?
- 3) Explain Why Newton's rings are circular in shape? **
- 4) Distinguish between Fresnel and Fraunhofer diffraction?
- 5) Why lenses are necessary for the study of Fraunhofer diffraction?
- 6) What is grating and write grating element?
- 7) What is polarization of light?
- 8) Engineering application of polarization?
- 9) Half wave and quarter wave plates?

UNIT-II

- 10) Discuss about Laser Characteristics?
- 11) What is an Optical Resonator? **
- 12) Explain (a) Stimulated Absorption, (b) Stimulated emission, (C) Spontaneous emission and (d) Population inversion? **
- 13) What are different pumping mechanisms in LASER? **
- 14) Applications of laser in Medicine?
- 15) Define what is 'Acceptance angle' and 'Numerical Aperture'
- 16) Working Principle (Total Internal Reflection) of Optical fiber?
- 17) List out losses in optical fiber?
- 18) Applications of optical-fiber?

UNIT-III

- 19) Define terms: Magnetic susceptibility and permeability with units?
- 20) What is Bohr magneton?
- 21) What is dielectric polarization and polarizability?
- 22) Show that $i.e. P = \epsilon_0 (\epsilon_r - 1)E$.

UNIT-IV

- 23) Derive the expression for de-Broglie wavelength?
- 24) De-Broglie hypothesis? What the properties of de-Broglie wave?
- 25) What is the source of electrical resistance?
- 26) What are merits and de-merits of classical free-electron theory?
- 27) What are merits and de-merits of quantum free-electron theory?
- 28) Classify solids into conductors, semiconductors and insulator?
- 29) What is effective mass?
- 30) Write an equation for density of states

UNIT-V

- 31) Properties of superconductors?
- 32) Explain d.c. and a.c. Josephson effect?
- 33) Define critical magnetic (H_c) field?
- 34) Properties of high T_c superconductors?
- 35) Applications of superconductors?
- 36) Distinguish between direct and indirect band gap semiconductors? ***
- 37) Distinguish between intrinsic and extrinsic semiconductors?
- 38) Distinguish between N-and P-type semiconductors?
- 39) Write drift and diffusion equations for semiconductor?